Approaches Toward Utilization of the Advanced Microwave Scanning Radiometer (AMSR) for Soil Moisture Sensing

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Abstract

The Advanced Scanning Microwave Radiometer (AMSR) is a multichannel passive microwave sensor developed by the Japanese Space Agency (NASDA). The AMSR is currently planned for launch on NASA's EOS-Aqua satellite (1:30 pm orbit) in December 2000 and on NASDA's ADEOS-II satellite (10:30 am orbit) in November 2001. Each AMSR will provide observations at 6.9 to 89 GHz (dual-polarized), with spatial resolution of about 60 km at the lowest frequency, and with global coverage every two days. A significant level of effort involving the hydrology community needs to be undertaken to ensure that maximum benefit is derived from AMSR data for hydroclimatology applications. This paper describes the current status of algorithms for retrieving soil moisture and associated land parameters from AMSR data. It describes the unique sampling characteristics of the sensor as they impact the retrieval problem. Two critical aspects of the retrieval are: understanding how vegetation, topography, and other land features affect the estimated average soil moisture over the 60-km footprint; and estimating the percent of global land cover over which successful soil moisture retrievals may be obtained. In this regard, the AMSR should be considered as a useful step towards a future dedicated soil moisture mission that would more optimally use a lower frequency sensor (1.4 GHz or L-band). An L-band sensor would provide more accurate retrievals over a larger percentage of global land area. The sensor sampling characteristics and spatial resolution also impose significant challenges for validating satellite-retrieved soil moisture. The use of scaling approaches in well-designed field experiments will be crucial in interpreting and utilizing the satellite results.